

## **2 Analysis of Variations in Ozone & Ozone Precursors**

### **2.4 Weekday – Weekend Differences in Hydrocarbon Reactivity**

#### **2.4.1 Abstract**

Special hydrocarbon measurements were made during the summers of 1995 and 1996 in the South Coast Air Basin. The reactivity of the morning and afternoon hydrocarbon mixtures was examined. The average reactivity of the hydrocarbon mixture decreased from 1995 to 1996 and from morning to afternoon. The average reactivity also appears to decline slightly from weekday to weekend.

#### **2.4.2 Introduction**

One factor in the Ozone Weekend Effect may be that relative differences in activities from weekdays to weekends in the industrial, commercial, residential, and recreational sectors may cause the reactivity of the ambient hydrocarbon mix to change. If the reactivity of the weekend emissions is greater than the reactivity of the average weekday emissions, then ozone formation would be more efficient and higher ozone concentrations would likely occur on weekends compared to weekdays.

One recent source of data readily available for investigating any change in hydrocarbon reactivity from weekdays to weekend was the sampling program during the summers of 1995 and 1996 in the South Coast Air Basin (Zielinska, 1999). Morning and afternoon samples were collected at four stations (Azusa, Burbank, Los Angeles-N. Main, and Santa Monica) for six (6) seven day periods during the summers of 1995 and 1996. The sampling periods are shown in Table 2.4-1.

We examined the reactivity differences between the weekday and weekend ambient hydrocarbon mixtures at Azusa, Burbank, and Los Angeles-N. Main; data from the Santa Monica site were not analyzed as it served as a background reference site for the original measurement program.

#### **2.4.3 Methodology**

Three-hour samples were collected in the morning and afternoon (from 0700-1000 and 1400-1700 PDT in 1995 and from 0600-0900 and 1300-1600 PDT in 1996). Over 150 compounds were searched for, identified, and quantified if present in the sample. For this analysis, all identified hydrocarbons (ranging from carbon number C2 to C12) were included, as well as the oxygenated hydrocarbons MTBE, formaldehyde, and acetaldehyde. The average morning and afternoon weight fraction of each hydrocarbon species for weekdays (Monday through Friday) and weekends (Saturday and Sunday) was multiplied by its MIR (Maximum Incremental Reactivity value) and summed to give the total reactivity of the normalized (per gram of hydrocarbon mixture) weekday and weekend hydrocarbon ambient mixture. Approximately 30 weekday samples and 12 weekend samples were averaged for the morning and afternoon sampling periods for each year.

#### **2.4.4 Results**

The results for 1995 and 1996 are shown in Figures 2.4-1 and 2.4-2, respectively. The following general observations were made:

- 1) The reactivity of the ambient hydrocarbon mixture dropped between 1995 and 1996.
- 2) The reactivity of the ambient hydrocarbon mixture appears to be slightly lower on the weekends than on weekdays.
- 3) Differences between weekday and weekend reactivity appear greater in the afternoon than in the morning.

The lower reactivity in the afternoon than morning seems counterintuitive and may indicate a deficiency in techniques for measuring oxygenated hydrocarbons.

#### **2.4.5 Recommendations**

Based on the preliminary nature of this analysis, the following recommendations are made:

- 1) Perform statistical analysis to determine if the differences outlined above are significant.
- 2) Perform a similar analysis with data collected by the Photochemical Assessment Monitoring Station (PAMS) network.
- 3) Investigate if improved hydrocarbon measurements are needed.

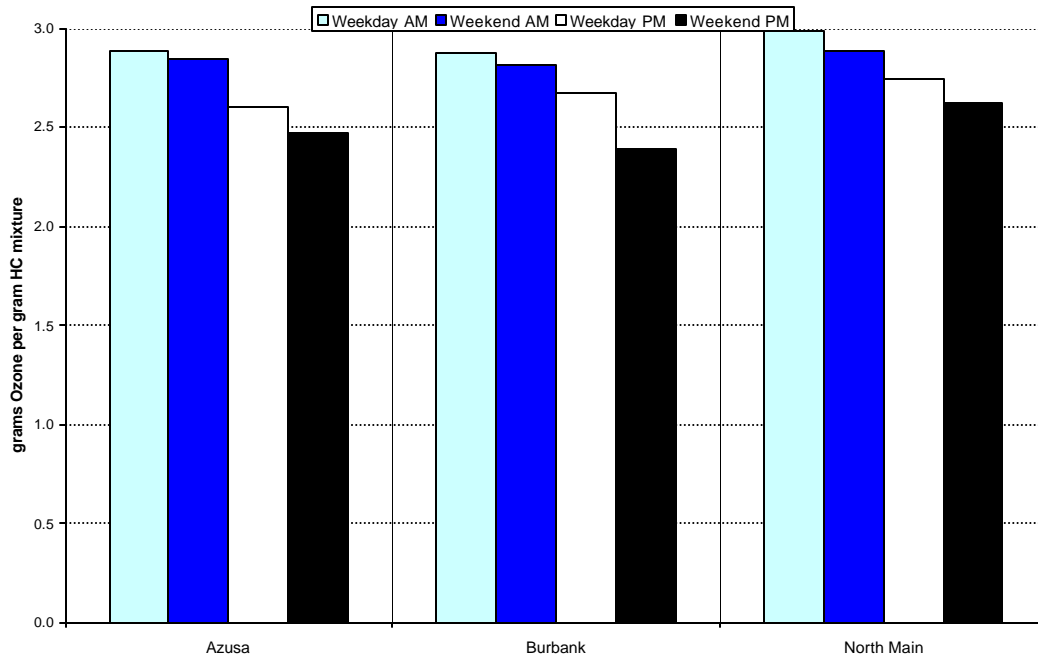
#### **2.4.6 References**

Zielinska B., J. Sagebiel, G. Harshfield, and E. Fujita (1999) "Air monitoring program for determination of the impacts of the introduction of California's Phase 2 Reformulated Gasoline on ambient air quality in the South Coast Air Basin," Final Report, California Air Resources Board, Contract No. 94-332, February.

**Table 2.4-1. Listing of weeks when special samples were collected to assess the impact of the introduction of reformulated gasoline in the South Coast Air Basin.**

<b>1995</b>	<b>1996</b>
July 8 – 14	July 7 – 13
July 17 – 23	July 28 – August 3
August 1 – 7	August 12 – 18
August 31 – September 6	August 27 – September 2
September 9 – 15	September 11 – 17
September 24 – 30	September 23 – 29

**Figure 2.4-1. 1995 Weekday/Weekend reactivity comparison.**



**Figure 2.4-2. 1996 Weekday/Weekend reactivity comparison.**

